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REMARKS

Applicant amended various of the claims for greater clarity, and canceled claim 12, all without prejudice.

35 USC 103

Applicant respectfully traverses the Examiner's rejections of claims 1-12.

U.S. Patent No. 6,372,408 (Lu et al.) has a filing date of June 21, 2000. Applicant has claimed priority of European Application No. 00480017.3 filed January 11, 2000. Accordingly, Applicant believes that Lu et al. is not prior art against the instant patent application. (35 USC 119)

Nevertheless, to the extent that any art rejection continues to be applied against claims 1-12, reconsideration is respectfully requested.

Neither Lu, Danh, nor Wedding, whether or not applied, either singly or in combination, teaches, discloses or suggests Applicant's method claims 1, 6 and 9 (as originally presented or as amended).

In a first case of Applicant's invention, the photoresist patterned wafer is heated in the 100-140°C range, then rinsed with DI water at room temperature (claim 1, as amended). In a second case, the photoresist patterned wafer is first rinsed as standard, then submitted to

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an extra rinse with DI water in the 40-60°C range (claim 6, as amended). Finally, in a third case, the photoresist patterned wafer is only submitted to a rinse with DI water in the 40-60°C range (claim 9). Therefore, in all cases of Applicant's invention, the photoresist patterned wafer is submitted, to a type of thermal shock after completion of the lithographic steps.

Lu is directed to, in effect, a method of developing the exposed photoresist layer. As far as the rinsing step is concerned, Lu teaches that several rinsing steps can be employed instead of one. The rinsing steps of Lu are performed as standard. On the contrary, to reduce blob defects, the method of the present application includes innovative rinsing techniques, at a step which is performed after the development (claims 1, 6 and 9, as amended).

Danh relates to a method for drying semiconductor wafers using a hot DI water bath upon completion of the cleaning step to remove particle contaminants. However, the combination of these two references, i.e., a method for developing an exposed photoresist layer in order to reduce the number of blob defects (Lu) and a specific temperature range taught for drying a semiconductor wafer after chemical cleaning (Danh) is deficient to anticipate or render obvious Applicant's techniques of rinsing a photoresist patterned semiconductor wafer upon completion of the development (which terminates the lithography steps) such as claimed in independent claims 1, 6 and 9 (as amended) of the present application. Moreover, not only this construct is deficient as noted above, but also there is no teaching, nor suggestion or incentive to combine these elements of the cited references, and in particular in the Danh reference. Further, Applicant believes Lu is not prior art to the instant application.

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Wedding relates to the fabrication of gas discharge displays. In the course of the described process, the photoresist development step (col. 18, lines 18-26) is performed as standard. It is followed by the standard hard bake step at 220°C (col. 18, lines 36-40), which aims to harden the photoresist mask and improves its adhesion, for the subsequent processing steps.

Accordingly Applicant believes any art rejection is overcome.

Entry of the Amendment and allowance of claims 1-11 are solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. This appendix is captioned "Version with Markings to Show Changes Made".

Respectfully submitted,
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Attachment: Appendix - Version with Markings to Show Changes Made

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Abstract:

Please amend the Abstract as follows:

Polymer blobs that are development related defects are substantially eliminated in [the] patterned photoresist masks by a heat treatment of the wafer performed at [the]a development step in two different manners according to the present invention. In the first method, after the development has been performed as standard, the wafer is heated at 140°C and before cooling takes place, it is rinsed with deionized water (DIW) at room temperature. In the second method, the wafer is either developed as standard but rinsed with 60°C DIW instead of 22°C DIW, or, after standard development, it is submitted to an extra rinse step with 60°C DIW.

[FIG. 6]

In the Claims:

Kindly cancel claim 12 in its entirety.

Kindly amend claims 1-4, 6-7 and 9-10 as follows:

1. (Amended) A method for eliminating [development related defects referred to as]polymer blobs in a photoresist mask formed at the surface of a semiconductor wafer, comprising the steps of:

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providing a semiconductor wafer having a photoresist layer formed thereon;

exposing, baking and developing the photoresist layer[as standard] to produce a patterned photoresist mask; and[,]

heating the wafer for a time sufficient to reach a temperature in [the]a 100-400°C range and without cooling it, and then rinsing the wafer with deionized water at a temperature equal to or higher than the room temperature.

2. (Amended) The method of claim 1 wherein [said]the semiconductor wafer comprises silicon.

3. (Amended) The method of claim 2 wherein [the]said step of heating the silicon wafer [is the]includes a step of post-development bake performed after [the]said development step[but without the usual cooling].

4. (Amended) The method of claim 3 wherein the silicon wafer is immediately rinsed after said bake step [to avoid any cooling].

6. (Amended) A method for eliminating [development related defects referred to as]polymer blobs in a photoresist mask formed at the surface of a semiconductor wafer, comprising the steps of:

providing a semiconductor wafer having a photoresist layer formed thereon;

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exposing, baking and developing the photoresist layer [as standard] to produce a patterned photoresist mask, [wherein the] and then rinsing [sub-step is performed] the wafer with deionized water (DIW) having a temperature in [the] a range of 40-60°C[instead of 22°C].

7. (Amended) The method of claim 6 wherein [said] the semiconductor wafer comprises silicon.

9. (Amended) A method for eliminating [development related defects referred to as] polymer blobs in a photoresist mask formed at the surface of a semiconductor wafer, comprising the steps of:

providing a semiconductor wafer having a photoresist layer formed thereon;

exposing, baking and developing the photoresist layer [as standard] to produce a patterned photoresist mask; and then

submitting the wafer to an extra rinse with deionized water at a temperature in [the] a 40-60°C range.

10. (Amended) The method of claim 6 wherein [said] the semiconductor wafer comprises silicon.

[12. A clean track system further comprising a heating device designed to heat the deionized water that is supplied to the developer modules in the 40-60°C range.]

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